PATENT SPECIFICATION

DRAWINGS ATTACHED

850,290

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COMPLETE SPECIFICATION

A Pumping Assembly

We, SYMINGTON WAYNE CORPORATION, a corporation organised and existing under the laws of the State of Maryland, United States of America, of Salisbury, State of Maryland, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to pumping assemblies, more particularly pumping assemblies for use with containers that are buried or underground.

Among the objects of the present invention is the provision of pumping assemblies which are particularly simple to instal and maintain.

According to the present invention, there is provided a pumping assembly adapted for use with an underground container containing a liquid, e.g gasoline, to be pumped and including an elongated casing adapted to be connected to said container for communication with the interior thereof, a pumping conduit disposed within said casing and extending in assembled condition into said container, and a discharge head secured to the upper end of said casing and adapted to receive pumped liquid in a discharge chamber for discharge therefrom, wherein a pump unit is secured to the lower end of said conduit and is suitable to be submerged into the liquid in the container, the upper end of said conduit is secured to a cover member forming a liquid chamber and being removably secured to said discharge head and sealed thereto, said discharge head spacedly surrounds the portion of said cover member containing said liquid chamber, said discharge chamber and liquid chamber being in communication with each other, and wherein discharge means is associated with said discharge head, said casing having an inner diameter large enough to allow passage of said pump unit therethrough when said pump unit, said conduit, and said cover member are assembled with or removed as a unit from said casing and discharge head.

[*Price 3s. 6d.*]

A particularly effective construction has electrical conductors fitted through the pumping conduit and equipped with a swivelled electrical junction box for connection to a suitable source of electric power. Furthermore, the venting and other pump discharge structures can be secured on the top of the discharge head so that the assembly can be buried almost completely in the ground with only the discharge head top accessible for maintenance operations or the like.

In order that the invention may be fully understood it will now be described with reference to the accompanying drawings in which:

Fig. 1 is a partially broken away vertical section along the line 1—1 in Fig. 2, of a pumping assembly in accordance with the present invention;

Fig. 2 is a plan view of the assembly of Fig. 1;

Fig. 3 is a fragmentary vertical section of the assembly of Figs. 1 and 2 taken along the line 3—3 of Fig. 2;

Fig. 4 is a sectional view similar to Fig. 3 of a modified form of pumping assembly embodying the present invention; and

Fig. 5 is a fragmentary view similar to Fig. 1 of a further modified form of the invention.

Referring now to the drawings, 10 indicates a portion of an underground tank having an opening 12 through which the contents of the tank can be reached. Threaded in opening 12 is an elongated casing 14 which extends from the tank to the discharge head 16 conveniently located at or adjacent to the ground level A flange 18 threaded to the top of the casing is shown as secured to a flange 20 on the bottom of the head, as by bolts 22. A sealing gasket 24 compressed between flanges 18 and 20 can be used to make the connection fluid-tight.

Between a pair of adjacent bolts 22 and discharge head 16 is enlarged to provide a lateral extension or wing 25. The top of the discharge head is also flanged at 28 around a bore 30, and another bore 32 at the bottom flange 20 cooperates with it to form an effec-

tive continuation for casing 14. Between its flanges the discharge head has a hollow collar 34 which opens into wing 25.

Bores 30 and 32 preferably have an internal diameter at least as large as that of casing 14 so that a pump and motor combination 36 can be introduced through the head and casing into the container 10. In the figure, the pump and motor combination is shown as supported by a nipple 38 which is threadedly engaged to the bottom of a pump conduit 40. The top of this conduit is in turn threadedly engaged in the floor 42 of a hollow cover 44. This floor is arranged to seal against the wall of bore 32, and an O-ring 46 carried in a groove in the lateral face of the floor makes a very effective seal.

The hollow cover 44 has a flanged top 48 that overlaps flange 28 on the top of the discharge head. Flanges 48 and 28 are sealed together as by means of the bolts 50, and another O-ring 52. Connecting the floor 42 and top 48 of the cover is a tubular web 54 which encircles an internal space 56. This space 56 communicates with chamber 26 through one or more ports 58 in web 54.

In the illustrated construction the pump motor is an electric motor and has conductor leads 60 that extend through the length of conduit 40. A sleeve 62 can encircle the leads 60 so as to keep the leads out of contact with the fluid pumped up in the conduit. The lower end of sleeve 62 can for this purpose be threadedly engaged in the motor and the upper end can penetrate through an aperture 64 in cover flange 48. To make sure that the pumped fluid does not leak out through aperture 64, a gland type of packing is shown in Fig. 1. This includes packing 66 encircling sleeve 62 and received in a recess 68 on the cover top 48, the recess being surrounded by a tubular wall 70 to make a packing gland. Threadedly fitted within the wall 70 is a packing gland nut 72, the lower end of which is jammed against the packing 66 by suitable tightening of the threaded connection.

If it is desired to completely seal the space within the sleeve 62 from communication with the exterior, the mouth 74 of sleeve 62 can be filled with a plastic sealing mixture 76 such as that made by mixing one part by weight water, two parts by weight of glycerine, and eight parts by weight of litharge. The plastic mixture is preferably squeezed into the sleeve mouth so as to fill up all the space between the internal surface of the sleeve and the external surfaces of the conductors 60. A three-quarter inch depth of such sealing is generally sufficient.

A very useful feature of the present invention is the provision of an electrical junction box 78 on the cover top 48 surrounding the site where the conductors emerge, this junction box having a lateral nipple 80 and being freely rotatable so that the nipple can be oriented in any direction. As shown, the junction box is in the general form of a hollow, flat cylinder with a journal lip 82 turned up from the cylinder floor and journalled about the packing gland wall 70. An expandable spring ring 84 engaged in an outwardly facing groove 86 of wall 70 projects outwardly far enough to keep the junction box from being accidentally removed. The box is also shown as having a removable cover 88 threaded in place and provided with a set of upstanding lugs 90 between which a rotating tool can be fitted when the cover is to be applied or removed. The interior of the junction box can be sealed, as shown for example, by the sealing rings 92, 94, with respect to the packing gland wall and the cover.

For a more dependable electrical interconnection between the junction box and discharge head, to make sure the box is properly grounded for example, an electrical bonding conductor 95 can be firmly secured to the respective members as shown in Fig. 2. The conductor can be either flexible, to allow box rotation, or rigid to restrict such rotation.

In the lower portion of the discharge head extension, the wing 25 opens into a lower chamber 26 which is separated from an upper chamber 96 by an L-shaped internal web 98. In this web there is a communication passage 100, and a combination check and pressure-relief valve 102 cooperates with this passage. In the illustrated embodiment this valve is made up of a sealing disc 104 carried by a supporting disc 106 and threadedly clamped on a floating pin 108 between a nut 110 and an enlarged head 112. A biasing spring 114 urges the sealing disc downwardly into closing engagement against wall 100. A guide recess 116 in a cover block 120 keeps the pin properly aligned so that after being forced upwardly it will return to its proper sealing position. The cover block can also have a relief passageway 122 communicating on the one hand, with the guide recess 116 and the hollow interior 124 of pin 108 and on the other hand with chamber 96, and a pressure relief valve 126 is inserted in the head of pin 108 whereby to provide a pressure relief exhaust from chamber 96.

Upper chamber 96 opens into an outlet pipe, as shown at 130 for example in Fig. 2, on one face 132 of the discharge head extension 25. The opposite face 134 can also have provision for a discharge pipe, if desired. In Fig. 2 a plug 136 is shown as sealing the outlet on face 134.

For the venting of vapors or gases that are pumped up along with liquid from container 10, the discharge head, as shown in Fig. 2, also includes a by-pass from chamber 26 back to the space between casing 14 and conduit 40. The details of this arrangement are shown in Fig. 3, where the upper portion of chamber 26 adjacent the periphery of cover 48 opens

into a passageway 140 in the side wall of the head at a location spaced from the extension 25. This passageway 140 opens at 142 in the top of the head adjacent a well 144 that also opens at the top of the head. A check valve 146 is mounted near the bottom of the well close to a by-pass return passageway 148 that opens into the space between casing 14 and conduit 40. The check valve can be held in place as by means of a sleeve 150. To make sure that all by-passing fluids are controlled by the check valve, the outer surface of the sleeve 150 is preferably sealed against the discharge head wall as by closely fitting it in place and, in addition, cementing at least the upper portion of it with the litharge-glycerine-water mixture described above. The check valve itself can be of any desired construction and, as illustrated, can have a longitudinally grooved plug 154 fitted with a replaceable insert 156 clamped in place by plate 158. The insert is held biased against a ring-shaped seat 160 by means of a coil spring 162 compressed between the seat and an elastic C-ring 164 mounted in a groove in plug 154.

With the above construction a block 170 having a U-shaped passageway 172 can be fastened to the discharge head as by the bolts 176 (Fig. 2) so as to complete the by-pass path from 140 to the return 148. For added precautions, seals 178 and 180 can be placed around the mouths at each end of the U-shaped passageway.

The block 170 can also be equipped with an ejector assembly for supplying liquids from a separate line 192, as for example to add liquid to tank 10. The illustrated ejector assembly includes a venturi tube 198 threadedly fitted in the discharge mouth of passageway 172 and projecting out below the bottom of the block 170 so that it is received in well 144. A jet nozzle 200 is also held in block 170 and is spaced a small amount from the venturi tube so as to cooperate with it to form an ejector. This nozzle can be made externally accessible as by a removable plug 202 threaded into the top 194 of the block and sealed, if desired, as by the sealing ring 204. A side inlet 206 in the jet nozzle opens into the remainder of passageway 172, and in the low pressure area of the venturi, an external opening 208 communicates with a connector nipple 210.

Fig. 4 shows another embodiment of the invention in which a plain block 190, not equipped with an ejector assembly, takes the place of block 170.

The various components of the pumping assembly can be made of any desired materials, metals being preferred where toughness is needed. However, plastics can also be used with due provision that the plastics are not attacked by the fluids to be pumped. For pumping gasoline or the like, aluminium parts are particularly desirable since aluminium does not generate sparks when struck, and at the same time makes a very effective sealing surface. The mating surfaces of the valves are preferably of brass or similar materials that resists corrosion, and the valve spring can also be made of non-corrodable material such as brass or even stainless steel. Gaskets and sealing rings are desirably made of chloroprene or neoprene type rubber that can be filler-free, or can contain up to 30% of asbestos fibers. The packing 66 and gasket 24 can be a rubber-asbestos mixture which is as much as half asbestos fibers.

Assembled in the above manner, the pumping assembly of the present invention operates when the pump motor is energized as by means of an outside switch inserted in the electric lines. When energized, liquid is pumped up from the tank through the passageway between the pump conduit 40 and sleeve 62, through the interior 56 of cover 44, ports 58, chamber 26, check valve 102, chamber 96, into pipe 130. The biasing of check valve 102 need not be very large where the pressure in pipe 130 need not have any predetermined minimum. For gasoline pumping, the check valve should open for pressures as low as 1/10 pound per square inch. As soon as the pump motor is deenergized, the pressure in the outwardly moving liquid stream is reduced and the check valve will then close, thereby barring the return of the liquid from outlet pipe 130 back into the pump assembly. This is very desirable for gasoline pumping.

Check valve 146 can also be arranged to open with pressures even lower than 1/10 pound per square inch, e.g. 1/20 pound per square inch. This helps in venting off gasses. The passageway provided by valve 146 should be smaller in cross-sectional area than that for valve 102 to keep too much liquid from recirculating.

A feature of the present invention is that the pumping assembly can be buried in the ground right up to the top of the discharge head, if desired, or to any intermediate depth. All valves and moving parts can be serviced without disturbing the discharge head. Replacement of the motor can be readily made by unfastening the bolts 50 and after disconnecting the electric lines, lifting the whole cover 48 upwardly. Because the pump and motor assembly is small enough to fit through the casing 14, as well as the openings 30 and 32, the pump, motor, conduit 40, and whole head 48, will all come out as a unit. To simplify this extraction, particularly where the tank is very deeply buried, or the extracted articles are very heavy, eye-bolts 220 can be threaded or welded into the top flange of cover 48, or the bolts 50 can be provided with lifting eyes as part of their heads.

The pumping assembly of the present invention can have more than one discharge head wing, and can, if desired, be used with other

types of junction boxes, or even with other types of pumps. The assembly is also adaptable for containers that are not underground, but are inaccessible for other reasons.

The sealing surface 32 can be tapered, and the seal above surface 30 can be moved down to surface 30 which can also be tapered. Alternatively the seal against surface 32 can be moved up to the top of the discharge head floor, which can be suitably shaped for this purpose. Furthermore, the cover 44 can be made integral with the conduit 40.

Fig. 5 shows a modified conduit and cover construction in which the conduit 240 is connected to a cover 244 that does not have the cage-like construction illustrated in Fig. 1 Instead, cover 244 is in the form of a more-or-less simple block with the appropriate sealing arrangements for the associated structures such as flange 28, gland 72, etc. A well 248 in the lower face of the cover directly receives the upper end of the conduit which can be secured in place as by a threaded joint. The well in turn communicates with chamber 226 as by means of inclined passageways 250 drilled through the block. If desired, however, the side wall of the well 248 can merely be longitudinally grooved along one or more small portions of its periphery and thus provide the required communication. Where a threaded connection is made with the conduit, the one or more peripheral portions of the thread are merely cut by the grooving, without interfering with the threaded connection.

In order to close off the chamber 226 from the annular space between the conduit and the casing, the construction of Fig. 5 also includes a sealing collar 252 threadedly held at its upper end on the conduit, and carrying a sealing ring 246 at its lower end for engagement with the wall 232. The threaded connection between collar 252 and the conduit 240 should be sealed against leakage, as in the usual pipe-fitting technique, whereas the connection to the cover block 244 need not be so sealed.

Instead of an elongated collar, the desired sealing against wall 232 can also be provided by a narrow ring-like collar clamped against the outside of the conduit opposite that wall.

Instead of the litharge-glycerine-water sealing mixture, resin or other types of mixtures can be used. An effective resin for this purpose is the epoxy type materials described in the Narracott article in British Plastics issue of October 1951, pages 241—345. The invention can also be utilized without the pressure relief valve 126 and even without check valve 146.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

WHAT WE CLAIM IS:—

1. A pumping assembly adapted for use with an underground container containing a liquid e.g. gasoline, to be pumped and including an elongated casing adapted to be connected to said container for communication with the interior thereof, a pumping conduit disposed within said casing and extending in assembled condition into said container, and a discharge head secured to the upper end of said casing and adapted to receive pumped liquid in a discharge chamber for discharge therefrom wherein a pump unit is secured to the lower end of said conduit and is suitable to be submerged into the liquid in the container, the upper end of said conduit is secured to a cover member forming a liquid chamber and being removably secured to said discharge head and sealed thereto, said discharge head spacedly surrounds the portion of said cover member containing said liquid chamber, said discharge chamber and liquid chamber being in communication with each other, and wherein discharge means is associated with said discharge head, said casing having an inner diameter large enough to allow passage of said pump unit therethrough when said pump unit, said conduit, and said cover member are assembled with or removed as a unit from said casing and discharge head.

2. A pumping assembly according to claim 1, comprising venting means and a pump discharge outlet structure in said discharge head laterally of the pumping conduit, said casing carrying remote from said container a flange extending over and in sealing relation to said discharge head for fastening the latter to the casing.

3. A pumping assembly according to claim 2, wherein said venting means and said pump discharge outlet are replaceably secured to the top of said discharge head.

4. A pumping assembly according to claim 1, 2 or 3, comprising electrical conductor means disposed in said conduit for energizing said pump, a swivelled electrical junction box being provided adjacent the outer end of said conductor means for connecting the latter to a power supply.

5. A pumping assembly according to claim 2, 3 or 4, wherein said venting means includes a pair of openings in the top of the discharge head, passageways connecting said openings to said discharge chamber and casing respectively, and a replaceable connection block secured to said discharge head over said openings.

6. A pumping assembly according to any one of the preceding claims, wherein said discharge head includes a return flow control mechanism controlling flow from said chamber into said container by way of a space between said conduit and said casing.

7. A pumping assembly according to claim 6, wherein said pump discharge outlet includes

a check valve mechanism.

8. A pumping assembly for buried containers said assembly including a pumping conduit with pump holding elements on one end, a casing sleeve around the conduit and having at its corresponding end connection means for connection to an opening in the container, a discharge head fitted over the other end of the casing sleeve and defining a chamber extending to one side of the conduit, a pump discharge outlet in communication with said chamber, a passageway through the discharge head as a prolongation of the casing, the other end of the conduit communicating with the chamber, being closed off from the casing, penetrating through said passageway, and being covered by a flange structure that seals against the discharge head, the casing and the passageway being wide enough so that the conduit pump holding elements as well as a pump can be inserted and withdrawn through the casing without disturbing said pump discharge outlet structure.

9. A pumping assembly for use with a liquid container, constructed and adapted to operate substantially as described and shown in the accompanying drawings.

STEVENS, LANGNER, PARRY
& ROLLINSON,
Chartered Patent Agents,
Agents for the Applicants.

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850290 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig. 1.

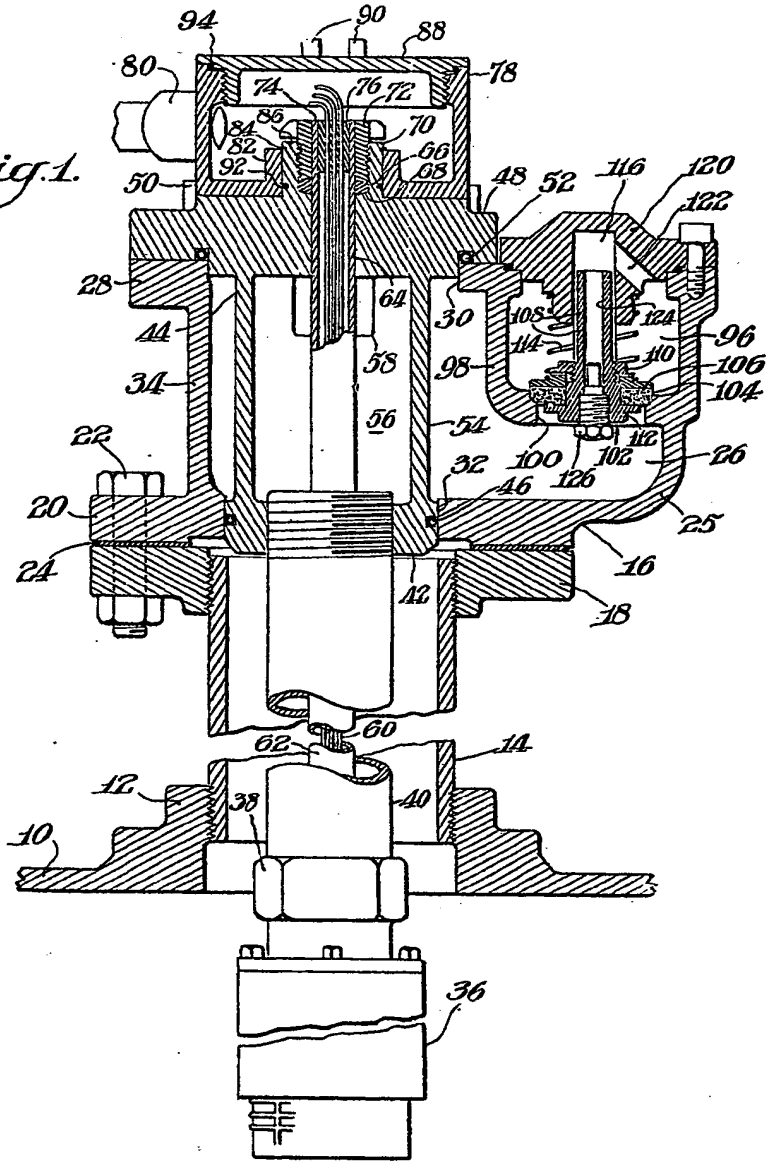
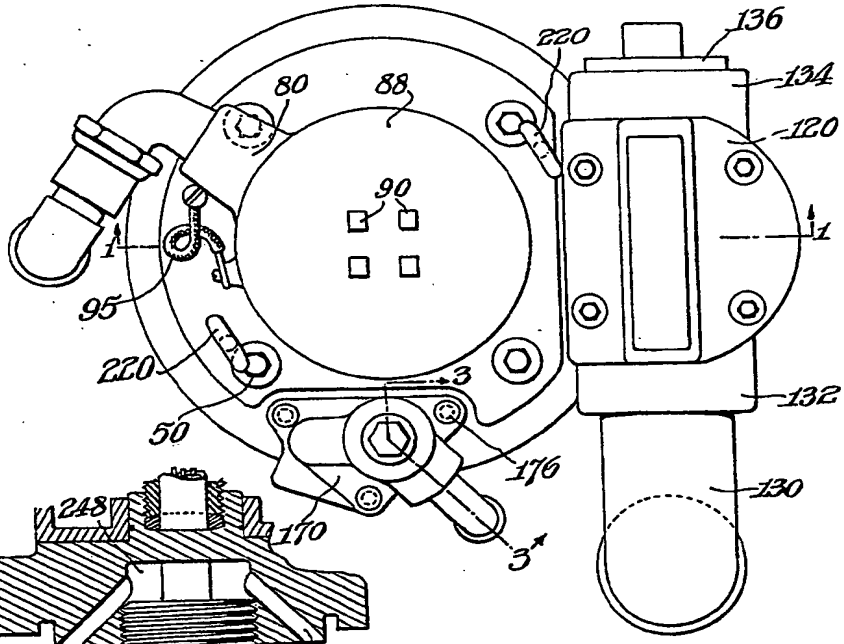


Fig. 2.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134
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120
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1
95
220
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132
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176
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226
240
252
232
246

Fig. 5.

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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 2 & 3

134
120
1
132
7

Fig.3.

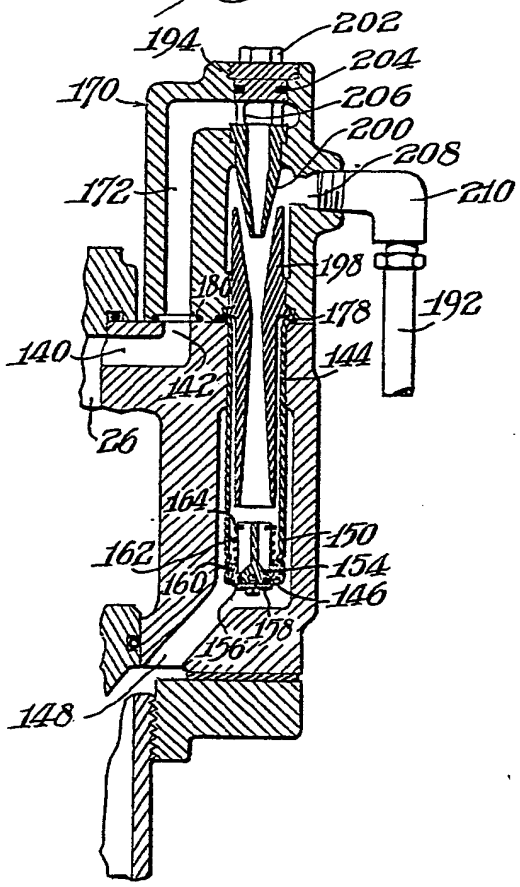

Fig.4.

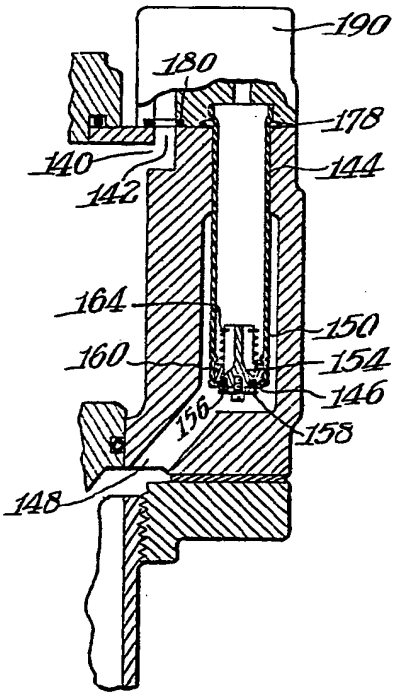

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Fig. 2.

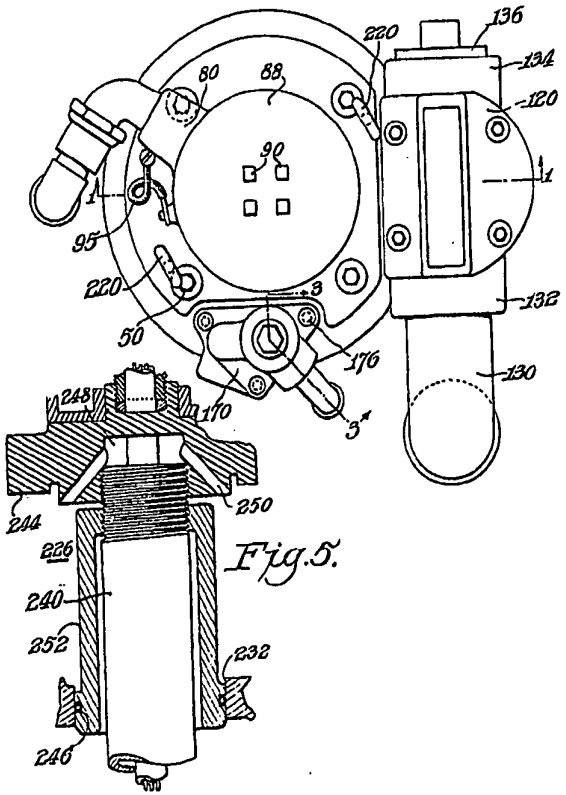

Fig. 5.

Fig. 3.

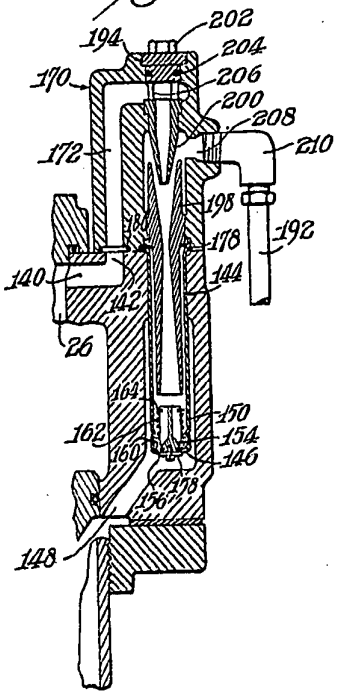

Fig. 4.